AMENDMENTS TO THE SPECIFICATION

Please replace the following numbered paragraphs 0042, 0045, 0047, 0048, 0049, 0055, 0067, 0076, 0077, 0078, 0079, 0080, 0082, and 0086 with the similarly numbered paragraphs in the original specification. These replacement paragraphs are marked to indicate the changes from the previous paragraphs.

[0042] The clamp 28 further comprises jaws 42 and 44. Jaw 42 has a generally arcuate shape with first and second ends 46 and 48, and a concave inner surface 50 and a convex outer surface 52. Similarly, jaw 44 has a generally arcuate shape with first and second ends 54 and 56, and a concave inner surface 58, and an convex outer surface 60. The outer surface 52 of the first jaw 42 is hingedly mounted on the distal end 36 of the first arm 30, at a point intermediate the ends 46 and 48. Similarly, the outer surface 60 of the second jaw 44 is hingedly mounted on the distal end 40 of the second arm 32, at a point intermediate the ends 54 and 56. In this preferred embodiment the arms 30 and 32 are at least 0.5 inches long and are preferably between about 0.6 and 0.7 inches long. This length allows the irrigation line secured in the clamp to be spaced from the body 16, leaving the second end 20 of the body 16 open so that dirt and debris can fall through the passage 24, rather than accumulating in the passage and interfering with the insertion of ~~tee 14~~ tap 14 when used with either a 3/4 inch i.d. line, or with a 1 inch i.d. line.

[0045] The jaws 42 and 44 are adapted to be secured together to engage and compress an irrigation line L (Figs. 3, 7A, and 7B) between them. The first jaw 42 has a raised ridge 68 on its outer surface 52, adjacent the second end 48. The second jaw 44 has a raised ridge 70 on its inner surface 58, adjacent the second end 56. There is a shoulder 72 in the second jaw 44 that forms an offset portion 74 adjacent the second end 56 so that second ~~jaw~~ jaw 44 can overlap the first jaw 42, and the ridge 68 on the first jaw 42 engage the ridge 72 on the second ~~jaw~~ jaw 44. A tab 76 projects radially outwardly from the first outer ~~surface 54~~ surface 52 of the first jaw 42. The ~~shoulder 70~~ shoulder 72 and the tab 76 form surfaces that can be engaged by hand or by pliers, or a tool specially adapted for the purpose to draw the

jaws 42 and 44 together to compress an irrigation line L between them and engage each other. The shoulder 72 and tab 76 also help stabilize the irrigation line L and ~~saddle~~ saddle tee 12 from movement after burial.

[0047] An annular flange 118 projects from the tip 114 intermediate its proximal and distal ends. A grommet 119 can be provided on the tip 114, adjacent the flange 118. Alternatively, instead of flange 118, a shoulder can be formed on the exterior of the tip 114 for engaging the irrigation line and supporting the grommet 119. This shoulder can be the shoulder formed between the tip 114 and the second end 104 of the body 100, as shown in Fig. 2. The grommet 119 preferably has a tapered exterior surface. The grommet 119 can be made from a resilient material to facilitate sealing the tip with the irrigation line. The flange 118 could be formed by the distal end of the threads 106, which can be constructed to compress the irrigation line L.

[0048] A passage 120 extends through the tap 14. A first end of the passage 120 opens at 122 in the grip 108, a second end of the passage 120 opens to windows 124 in the side of the tip 114, between the point 116 and the flange 118. A window 124 can also be provided in the distal end of the tip 114, particularly if a cutting member is provided on the tip 114.

[0049] In a preferred embodiment of this invention, there are two windows 124 on opposite sides of the tip 114. These windows 124 have an inverted triangle shape with a height of about 0.35 – 0.4 inches and a maximum width of about 0.25 – 0.3 inches. The vertical extent of the windows 124 allows the tee to be used with a range of sizes of irrigation lines from about 0.75 inches and about 2 inches. This vertical extent of the windows 124 ensures that some portion of the window 124 extends into the lumen of the irrigation line, yet the vertical extent is not so great that the window 124 bridges the inside and outside of the irrigation line. The windows are preferably large compared with the cross sectional area of the passage through the tip 114, so that the openings are sufficiently large to conduct fluid from irrigation

lines, even when the line is sized such that the entire window does not penetrate the lumen. In a preferred embodiment, the windows each have an area of about ~~0.06 in2~~ 0.06 square inches or a total area of about 0.12 ~~in2~~ square inches, which is roughly equal to the internal area of the tip 114 (0.125 ~~in2~~ square inches for a 0.4 inch diameter).

[0055] The saddle tee 12 can be installed on the irrigation line L with the ~~passage 28~~ passage 120 oriented generally vertically, so that the tap 14 can be inserted into the irrigation line. However, the saddle tee 12 of the present invention is adapted to be mounted on the irrigation line L with the passage extending generally horizontally. This allows the line to be buried shallower, and helps reduce the incidence of the saddle tee and tap projecting above the surface of the ground.

[0067] Where the pitch of the threads on the tip 201 is generally the same as the pitch of the threads 106, the wall tip 201 penetrates the irrigation line at the same rate as the tap is advanced in the saddle. However, in another preferred embodiment, the threads on the tip have a smaller pitch than the threads 106 on the body, or more preferably the pitch of the threads varies and decreases to a pitch that is less than the pitch of the threads 106 on the body. ~~In this case. Thus~~ Thus, after the threads penetrate the wall, they advance faster relative to the wall then the tap advances relative to the saddle tee 12, which pulls the wall proximally toward the proximal end of the tip 201, engaging and preferably helping to form a seal with the portion of wall surrounding the puncture, and also opening the line for greater flow.

[0076] In the most preferred embodiment, the pitch of the threads 204 varies, such that the pitch P1 at the distal end of the tip thread 204 is smaller than a pitch P2 of the same thread 204 at a point more proximal than P1. Thus, the pitch of the tip thread 204 decreases toward the proximal end of the tip 202. The greater pitch of threads 204 at the distal end, more easily thread into and engage the wall of the irrigation line, while the small pitch of the threads at the proximal end pulls the wall of the irrigation ~~line~~ line L upwardly faster than the tap advances toward the irrigation line. Thus, after the threads 204 starts

threading into the wall, the connection to the irrigation line L is swiftly and surely completed with fewer turns than required with a constant pitch ~~thread 202~~ thread 204.

[0077] In one preferred embodiment, the tip threads 204 are configured to allow completion of the connection with the irrigation line L connection (from tip ~~thread 202~~ thread 204 engagement with the wall through to ~~grommet 118~~ grommet 119 compression) with only two turns of the tap 200. Further, the decreasing pitch of the threads 204 also eases user fatigue.

[0078] Another embodiment of a tap constructed according to the principles of this invention is indicated generally as 214 in Figure 9. As shown in Figure 9, the tap 214 is also adapted for use with saddle tee 12, described above. The tap 214 is similar in construction to tap 200 and corresponding parts are identified with corresponding reference numerals. The tap 214, like tap 200, has a ~~tip 212~~ tip 202. However, rather than threads 204, the tap 214 has threads 216, which comprise a distal section where the threads have a pitch P1, and a proximal section where the threads have a pitch P2.

[0079] The distal portion of the tap 214 has a diameter D1, and the proximal portion of tap has a diameter D2. The Diameter D1 includes the threads 216. The diameter D2 does not include the threads 106. The ~~tip 212~~ tip 202 of the tap 214 preferably has a distal end section of length d1 that is unthreaded, an intermediate section containing the threads 216 of length d2, and a proximal section 218 of length d3.

[0080] As shown in Figure 9, the proximal section 218 lies between the threads 216 and the external threads 106. Moreover, ~~as diameter~~ the diameter of section 218 increases from the proximal end of the threads 216 to the distal end of the external threads 106. As shown, the section 218 has a curved longitudinal cross-sectional, of radius r. However, the section 218 could have some other cross-sectional profile, for example one in which the diameter monotonically, parabolically, and exponentially increases.

The contour could also be that of a straight line, a catenary curve ~~curve~~, a trigonometric curve, or any other type of curve.

[0082] It has been found in operation that the puncture may also result in two other particular types of ruptures 220. The first of these types of ruptures 220 is defined by a coupon. The coupon is a roughly disc shaped piece of the irrigation line wall formed during the puncture. These coupons remain hingedly attached to the irrigation line wall generally along a small arc, but are pushed out of the way as the tip 212 advances into the irrigation line L. Whether the ~~tip 212~~ tip 202 includes cutting teeth, a cutting member, or has blunt tip, the ~~tip 212~~ tip 202 may still create a coupon. For PVC, it has been found that a blunt ~~tip 212~~ tip 202 terminating in a point with a radius of curvature greater than 0.05 inches, and more preferably 0.1 inches forms the desired coupon. By creating the coupon, cracking in the wall of the irrigation line ~~are reduced~~ is reduced, if not eliminated, thereby allowing a better seal between the wall and the tap 214. For PVC, the reduction in cracking is particularly important because of the more brittle nature of PVC (as compared to other commonly used irrigation line materials).

[0086] However, the smooth surface and increasing diameter of the section 218, stretches the opening in the irrigation line, smoothing striations and surface defects formed during the initial penetration of the irrigation line. Moreover, ~~if the~~ the increasing diameter of the section 218 forms a self energizing seal with the irrigation ~~line~~ line L. The seal with the increasing diameter of the section 218 tightens as the irrigation line expands. It should be noted that the shoulder 218 may be included in taps in accordance with the present invention which do not have the threads on their tips. The contour or a portion of the contour of the section 218 may be shaped to complement the contour of the exterior surface 225. In addition a grommet (not shown) may be used in conjunction with the section 218.